

REMARKS/ARGUMENTS

Reconsideration of this application is requested. Claims 12-22 are in the case.

I. THE FORMAL REJECTION

Claim 12 again stands rejected under 35 U.S.C. §112, second paragraph, as allegedly indefinite in view of the recitation "substantial condensation". In response, and without conceding to this rejection, claim 12 has been amended to state that the partial pressure of the alpha-olefin in the reaction zone is maintained below an amount which would, at a temperature of 10°C less than the temperature of the monomer mixture in the reaction zone, be the saturated vapor pressure of the alpha-olefin to prevent condensation of said alpha olefin in the reaction zone. Basis appears at page 3, lines 11-15 of the specification. No new matter is entered.

While claim 12 as amended does not now refer to "substantial condensation", one of ordinary skill in this art would have been able, as of the filing date of the application, to carry out the claimed polymerization process in such a way as to prevent "substantial condensation" from occurring in the reactor. The required partial pressure of alpha-olefin and temperature of the monomer mixture would have been readily determined by the skilled artisan.

The indefiniteness rejection has now been obviated. Withdrawal of the formal rejection is respectfully requested.

II. THE OBVIOUSNESS REJECTIONS

Claims 12-19 stand rejected under 35 U.S.C. §103(a) as allegedly unpatentable over Murray (US 2003/0171206), in view of Jenkins III *et al.* (US 4,588,790 or 4,543,399) (Jenkins). Claim 17 is rejected under 35 U.S.C. §103(a) as allegedly unpatentable over Murray in view of Jenkins and further in view of Muhle *et al.* (US 6,180,736) (Muhle). Claims 19-20, and 22 are rejected under 35 U.S.C. §103(a) as allegedly unpatentable over Murray and further in view of Babb *et al.* (US 6,627,573) (Babb). Claim 21 is rejected under 35 U.S.C. §103(a) as allegedly unpatentable over Murray in view of Devore *et al.* (US 5,470,993) (Devore) and further in view of Babb. The rejections are respectfully traversed.

The claimed invention provides a process for the copolymerization of ethylene and an α -olefin having 7 to 10 carbon atoms in a fluidized bed gas phase reactor in the presence of a single site polymerization catalyst. The process is carried out in condensed mode, and the partial pressure of the alpha-olefin in the reaction zone is maintained below an amount which would, at a temperature of 10°C less than the temperature of the monomer mixture in the reaction zone, be the saturated vapor pressure of the alpha-olefin to prevent condensation of the alpha olefin in the reaction zone.

It has surprisingly been discovered, according to the present invention, that in order to operate copolymerizations using higher α -olefins as comonomers in condensed mode operation, it is advantageous to operate the process such that the amount of the α -olefin is maintained below that at which substantial condensation in the reactor occurs. In other words, according to the claimed process, the partial pressure of the

alpha-olefin in the reaction zone is maintained below an amount which would, at a temperature of 10°C less than the temperature of the monomer mixture in the reaction zone, be the saturated vapor pressure of the alpha-olefin to prevent condensation of said alpha olefin in the reaction zone. The claimed process is operated under condensed mode of operation by use of, for example, a suitable inert substance in the recycle stream and under conditions such that the amount of the α -olefin (e.g., octene) is maintained below that at which substantial condensation in the reactor occurs.

By use of the process conditions of the present invention, higher α -olefins may be successfully employed in a gas phase process provided the amount of higher α -olefin comonomer is maintained below that at which substantial condensation occurs. Such operation is also dependent upon the operation temperature and the boiling point of the higher α -olefin. The process is particularly advantageous when performed in the presence of catalysts able to incorporate high levels of comonomers at low comonomer inventories.

Murray does not disclose operation in condensed mode. Murray only discloses that single site catalysts may be used for processes operating in the gas phase, one of which may be a fluidized bed process in which a recycle stream is used to return gas to the reactor to maintain the fluidized bed. Murray clearly does not suggest the claimed process.

Jenkins does not cure the above-noted deficiencies of Murray. Murray is relied upon as allegedly describing the operation of a fluidized bed reactor in condensed mode. From this, the Action concludes that it would have been obvious to combine Murray and Jenkins to arrive at the present invention. This is not correct.

The Action discusses partial pressures of the comonomers described in Murray. In para [0115] of Murray, there is a general description of comonomers having 2 to 30 carbon atoms, preferably 2 to 8 carbon atoms. Para [0117] of Murray describes gas phase processes with comonomers having preferably 4-8 carbon atoms. Para [0119] of Murray describes ratios for the molar ratio of comonomer to ethylene but without any direction to specific comonomers. The preferred range in Murray at this point is 0.002 – 0.008.

In the presently claimed process, the ratio for octene as comonomer is 0.0001 to 0.02 (claim 15) and for decene as 0.00005 – 0.005 (claim 17). It is clear, therefore, that the proposed ranges for the present invention may be much lower than the general ranges described in Murray. In addition, there is no specific indication in Murray as to suitable ranges for the higher comonomers, such as octene or decene.

The Action considers that Jenkins would have been inherently devoid of "substantial condensation" if operated as directed by Murray. This is not correct, and is based on hindsight that if the process of Jenkins is operated at *some of the ratios* disclosed in Murray using *some of the disclosed* comonomers, the process must operate such that there will be no substantial condensation in the reactor. On the contrary, the present inventors have found this out by careful choice of the ratios of comonomer to ethylene for higher olefins such as octene and decene. The inventors have further discovered that by maintaining the partial pressure of the alpha-olefin in the reaction zone at below an amount which would, at a temperature of 10°C less than the temperature of the monomer mixture in the reaction zone, be the saturated vapor pressure of the alpha-olefin, condensation of the alpha olefin in the reaction zone may

be prevented. As a result, the claimed process may be performed in the presence of catalysts which are capable of incorporating high levels of comonomers at low comonomer inventories.

Absent any suggestion in the combined disclosures of Murray and Jenkins of the process as now claimed, it is clear that a *prima facie* case of obviousness of claims 12-19 has not been generated in this case. Withdrawal of the obviousness rejection of claims 12-19 over Murray in view of Jenkins is respectfully requested.

Referring to the obviousness rejection of claim 17 over Murray, Jenkins and Muhle, the Action admits that the lower ranges of the ratio of comonomer to ethylene are not disclosed in Murray. Muhle describes gas phase processes operating in condensed mode where it is desirable to minimize the concentration of alpha-olefin necessary to achieve a given polymer density and that the ability to use less alpha-olefin permits higher levels of condensed liquid to be employed in condensed mode operation which permits for higher production rates. However, there is no specific disclosure or suggestion in Muhle with respect to higher alpha olefins. The Action takes the disclosure of Muhle (as with Murray and Jenkins) and generalizes to the specific higher alpha-olefins of the present invention, which clearly involves improper reliance on hindsight. The present invention is directed to these higher alpha-olefins and it is this which distinguishes the claimed process from the cited prior art. This is particularly the case now that the claims are amended to the control of the polymerization process. Withdrawal of the obviousness rejection of claim 17 over Murray, Jenkins and Muhle is respectfully requested.

Referring to the obviousness rejections of claims 19-20 and 22 over Murray in view of Babb, and claim 21 over Murray in view of Devore and further in view of Babb, these claims are directed to the use of metallocenes as the single site catalysts of the present invention. These claims are dependent on claim 12 and, thus, are not suggested by the cited art for the above-discussed reasons. Withdrawal of the obviousness rejections of claims 19-20 and 21 and 22 is respectfully requested

In summary, the claimed invention is directed to the control of a polymerization process and is, in effect, a selection invention over the general disclosures of Murray, Jenkins and Muhle. Murray discloses the use of single site catalysts for polymerization which may be in solution, slurry or gas phase. Jenkins and Muhle disclose condensed mode operation in the gas phase. However, there would have been no motivation for one of ordinary skill, as of the filing date of the present application, to combine these references except to arrive at the use of condensed mode with the catalysts of Murray. None of the cited references is specifically directed to or suggests the copolymerization of higher alpha olefins. The mention of use of such olefins as part of a general description is not sufficient to give rise to a *prima facie* case of obviousness of the claimed process which is carried out in condensed mode together with the use of α -olefins having 7 to 10 carbon atoms, and wherein the amount of the higher α -olefin is maintained below that at which substantial condensation in the reactor occurs. Withdrawal of the prior art rejections is respectfully requested.

Favorable action is awaited.

Respectfully submitted,

NIXON & VANDERHYE P.C.

By: /Leonard C. Mitchard/

Leonard C. Mitchard
Reg. No. 29,009

LCM:iff
901 North Glebe Road, 11th Floor
Arlington, VA 22203-1808
Telephone: (703) 816-4000
Facsimile: (703) 816-4100